

Reply to Office Action of Aug. 13, 2009

Listing of Claims

1. (Currently Amended) A plasma display, comprising:

a panel forming an equivalent panel capacitor;

a first voltage source to charge the panel to a first polarity voltage; and

a second voltage source to charge the panel to a second polarity voltage different from the first polarity voltage at least one voltage source for supplying a sustain voltage to the panel;

an inductor for recovering an energy stored in the panel by a resonance phenomenon such that the recovered energy is reusable for driving the panel; ~~and~~

first and second switches arranged, in parallel, between the inductor and the panel capacitor, ~~wherein an electrically conductive path from a first conductor of the panel capacitor to a second conductor of the panel capacitor via the first switch is formed without passing through a ground, and~~

a third switch arranged between the first voltage source and the panel; and

a fourth switch arranged between the second voltage source and the panel,

wherein the inductor stores energy recovered from the panel when the first switch is on and the inductor applies the stored energy to the panel when the second switch is on, and wherein the inductor stores the energy at a time when a sustain voltage supplied to the panel is clamped at a predetermined voltage, and during at least a period of driving the plasma display, the first switch and the fourth switch are turned on together or the second switch and the third switch are turned on together.

2. (Canceled)
3. (Canceled)
4. (Original) The plasma display as claimed in claim 1, further comprising:
 - a first diode connected between the first switch and the panel; and
 - a second diode connected between the second switch and the panel.
5. (Currently Amended) An energy recovering method for a plasma display, comprising:
 - forming a first electrically conductive path between a first voltage source and the plasma display using a first switch;
 - forming a second electrically conductive path between a second voltage source and the plasma display using a second switch;
 - forming a third electrically conductive path between an inductor and the plasma display using a third switch; and
 - forming a fourth electrically conductive path between the inductor and the plasma display using a fourth switch connected, in parallel, to the third switch, said method further comprising:
 - shutting off a backward current from the plasma display using a first diode connected between the third switch and the plasma display; and
 - shutting off a backward current from the fourth switch using a second diode connected between the fourth switch and the plasma display,

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wherein the inductor stores energy recovered from the plasma display ~~without using a ground and~~ wherein a sustain voltage applied to the plasma display is clamped at a predetermined voltage when the second switch is closed, and current of the inductor is increased or decreased prior to discharging of a display capacitance.

6. (Canceled)

7. (Currently Amended) A plasma display comprising:

a display having a plurality of electrodes and having a corresponding panel capacitance between first and second nodes;

an inductor coupled to the second node and a third node;

a first switch coupled between the first and third nodes; and

a second switch coupled between the first and third nodes, the first and second switches being formed in parallel, wherein a first current path is formed via the panel capacitance, the second node, the inductor, the third node, the first switch and the first node, and a second current path is formed via the panel capacitance, the first node, the second switch, the third node, the inductor and the second node, and

wherein the second current path passes energy from the panel capacitance for storage in the inductor when the second switch is on, and the first current path applies the stored energy from the inductor to the panel capacitance when the first switch is on, and wherein the inductor stores energy recovered from the panel capacitance and a sustain voltage applied to the panel

capacitance is clamped at a predetermined voltage when the second switch is on and current of the inductor is increased or decreased prior to discharging of the panel capacitance.

8. (Original) The plasma display of claim 7, wherein the direction of the first and second current paths are opposite directions.

9. (Canceled)

10. (Currently Amended) The plasma display of claim 7, wherein the panel display capacitance is charge or discharged based on an LC resonance frequency.

11. (Currently Amended) The plasma display of claim 10, wherein the panel display capacitance is charged or discharged based on a non-LC resonance frequency.

12. (Canceled)

13. (Currently Amended) The plasma display of claim 11, wherein during charging or discharging, the panel display capacitance is clamped before a stored energy of the inductor reaches zero.

14. (Original) The plasma display of claim 7, wherein the first current path further comprises a diode coupled between the first switch and the first node.

15. (Original) The plasma display of claim 7, wherein the second current path further comprises a diode coupled between the first node and the second switch.

16. (Original) The plasma display of claim 7, further comprising:

a first clamping circuit coupled between the first and second nodes; and

a second clamping circuit coupled between the first and second nodes.

17. (Original) The plasma display of claim 16, wherein the first clamping circuit comprises a third switch coupled to the first node and a first potential via a first conductive path, and the second clamping circuit comprises a fourth switch coupled to the first node and a second potential via a second conductive path, wherein the first and second potentials are different.

18. (Original) The plasma display of claim 17, wherein the first potential is provided by a positive power source, and the second potential is provided by a negative power source.

19. (Currently Amended) In display panels having panel electrodes and corresponding panel capacitance between first and second nodes, an inductor coupled to the second node and a third node, a first switch coupled between the first and third nodes and a second switch coupled between the first and third nodes, the first and second switches being formed in parallel, an energy efficient method of driving said display panels through the inductor coupled to the panel electrodes, comprising:

(a) discharging the panel capacitance through said inductor initially while storing energy in said inductor until the magnitude of the inductor current reaches a maximum through a first current path formed via the panel capacitance, the second node, the inductor, the third node, the first switch and the first node, and secondly charging the panel capacitance

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through said inductor while removing the stored energy from said inductor until the inductor current reaches zero or before zero via the first current path; and

(b) discharging the panel capacitance through said inductor initially while storing energy in said inductor until the magnitude of the inductor current reaches a maximum through a second current path formed via the panel capacitance, the first node, the second switch, the third node, the inductor and the second node, and secondly charging the panel capacitance through said inductor while removing the stored energy from said inductor until the inductor current reaches zero or before zero through the second current path,

wherein said inductor stores said energy while the panel capacitance is clamped at first predetermined voltage and wherein said energy is removed from said inductor to cause the panel capacitance to change to a second predetermined voltage ~~and wherein an electrically conductive path from a first conductor of the panel capacitance to a second conductor of the panel capacitance via the first switch is formed without passing through a ground, and~~

wherein current of the inductor is increased during a previous period of discharging the panel capacitance of (a), and current of the inductor is decreased during a previous period of discharging the panel capacitance of (b).

20. (Original) The method of claim 19 further comprising:

maintaining panel capacitance after step (a) by a first clamping circuit having a third switch coupled to the first node and a first potential via a first conductive path; and

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maintaining the panel capacitance after step (b) by a second clamping circuit having a fourth switch coupled to the first node and a second potential via a second conductive path.

21. (Original) The method of claim 20, wherein storing and removing of stored energy in the inductor is based on an LC resonance frequency if the inductor current reaches zero.

22. (Original) The method of claim 20, wherein charging and discharging of the panel capacitance is not based on an LC resonance frequency via the first and second clamping circuit clamping the panel capacitance prior to the inductor current reaching zero.

23. (Original) The method of claim 22, wherein the first and second clamping circuits clamp the panel capacitance prior to the inductor current reaches zero.

24. (Canceled)

25. (Currently Amended) A plasma display panel driver circuit comprising:
a panel inter-electrode capacitor provided between at least one of a plurality of scanning electrodes and a plurality of sustain electrodes of a panel;
a charging/discharging circuit directly connected in series with said panel inter-electrode capacitor and between first and second nodes,
a clamping circuit having first and second switches for clamping a terminal voltage across the panel inter-electrode capacitor to a first power source voltage level and to a second power source voltage level, said first switch being connected in series between the first node and

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the first power source voltage level, said second switch being connected in series between said first node and the second power source voltage level, said inter-electrode capacitor being connected in series to the first and second nodes and said charging/discharging circuit and said clamping circuit being coupled in parallel between the first and second nodes,

wherein said charging/discharging circuit comprises a pair of switches coupled in parallel to each other between the first node and a third node and an inductive coil coupled in series between the second and third nodes,

wherein the inductive coil stores energy recovered from the panel inter-electrode capacitor when a first one of the pair of switches is turned on and the inductive coil applies the stored energy to the panel inter-electrode capacitor when a second one of the pair of switches is turned on, and wherein the inductive coil is coupled to the first power source voltage level and the second power source voltage level along signal paths that do not pass through any of the first or second switches or the pair of switches, and wherein the clamping circuit increases or decreases energy of the inductor coil prior to discharging of the inter-electrode capacitor.

26. (Original) The plasma display panel driver circuit of claim 25, wherein each of the pair of switches comprises a first transistor and a diode, and the pair of switches provide opposite current paths.

27. (Original) The plasma display panel driver circuit of claim 25, wherein the inter-electrode capacitor is charged/discharged based on an LC resonant frequency of the inductor coil and the inter-electrode capacitor.

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28. (Original) The plasma display panel driver circuit of claim 25, wherein the inter-electrode capacitor is charge/discharged based on a non-LC resonant frequency of the inductor coil and the inter-electrode capacitor.

29. (Original) The plasma display panel driver circuit of claim 28, wherein the clamping circuit clamps the inter-electrode capacitor one of the first and second power source voltage level prior to an energy of the inductor coil reaching zero.

30. (Canceled)

31. (Original) The plasma display panel driver circuit of claim 25, wherein each of said first and second switches comprises a transistor.

32. (Previously Presented) The plasma display as claimed in claim 1, wherein the inductor stores the energy during a time when the sustain voltage supplied to the panel is clamped at a negative voltage.

33. (Previously Presented) The plasma display as claimed in claim 32, wherein the second switch is turned on to allow the inductor to apply the stored energy to the panel when the sustain voltage is to rise to a positive voltage.

34-44 (Canceled)